CLINICAL CONFERENCE

The Present Status of Epilepsy

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EPHRAIM ROSEMAN,* M.D., AND CHARLES D. ARING,† M.D.: In the past as today, epilepsy has been and is incomprehensible, not only to the laity but also to many of the medical profession. Epilepsy is a disorder with relatively few objective signs and the diagnostic criteria are not always clear. As Lennox[4] has pointed out, much of its bad name has been due to misunderstanding of the nature of the disorder as well as to misconceptions about the therapeutic approach. Many people including members of the medical profession regard the illness as hopeless or as an incurable horror. This fear, for essentially that is what it is, may spring partly from the fact that the convulsion is not pleasant to witness; too, epilepsy has been wrongly considered by many to be synonymous with feeble-mindedness or mental illness. It should be stressed that most persons suffering from epilepsy may lead normal, happy lives, and function as mature people, if they are allowed an understanding of their problem and given the proper medication.

DEFINITION

The word *epilepsy* is derived from the Greek word for seizure. Although the word *seizure* is frequently used as a synonym for convulsion, some types of epilepsy are recognized which are without convulsion. Physiologically, epilepsy may be defined as a tendency to periodic involuntary neuronal explosions. In the murkiness of present-day ignorance, superstition, and fear, epilepsy for the sufferer may be defined as a state of continuing dread interrupted by recurring attacks of involuntary behavior. This behavior may be associated, temporarily to be sure, with mental or physical disturbances or both.

INCIDENCE

It is not generally known that the incidence of epilepsy is about the same as that of diabetes or tuberculosis. Approximately 0.5 per cent of the population of the United States have clinical epilepsy. Lennox[4] estimates that there are between 500,000 and 700,000 epileptics in this country. In his study of a group of 1,750 patients, there was estimated to have been a total of 3,900,000 seizures, an average of about 2,300 seizures per patient. Of these nearly 4,000,000 seizures, 71 per cent were petit mal, 26 per cent grand mal, and 3 per cent psychic seizures. It may be seen that the frequency of grand mal convulsions is not great relatively, and that it behooves the physician to know the other types of attack. It should be mentioned that as the result of the recent war many more epileptics will appear in the wake of injuries to the brain.

Reference to Table I will show the incidence of various types of clinical seizures and combinations thereof among 1,260 epileptic patients of various ages studied by Gibbs, Gibbs, and Lennox.[2] It may be seen that petit mal is essentially a disease of childhood, to be found rarely after the age of 30. Psychomotor epilepsy becomes more frequent in adulthood. Grand mal epilepsy remains relatively constant in frequency throughout the years of life.

It should also be noted that individuals may have more than one type of seizure. It is not at all unusual for an individual to give a history of petit mal epilepsy in childhood and to develop

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TABLE 1.—*Clinical Diagnosis*

	Petit Mal		Petit Mal and Grand Mal		Grand Mal		Grand Mal and Psychomotor		Psychomotor		Petit Mal, Grand Mal and Psychomotor		Focal		Total	
Age, Yr.	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0-4	10	20.0	3	6.0	31	62.0	0	0	1	2.0	0	0	5	10.0	50	100
5-9	26	25.2	12	11.7	46	44.7	3	2.9	6	5.8	1	1.0	9	8.7	103	100
10-14	27	17.1	35	22.2	71	44.9	9	5.7	9	5.7	0	0	7	4.4	158	100
15-19	15	6.8	46	21.1	113	51.6	12	5.5	16	7.3	6	2.7	11	5.0	219	100
20-24	4	2.3	39	22.5	93	53.8	10	5.8	18	10.4	4	2.3	5	2.9	173	100
25-29	6	4.3	18	13.0	79	57.2	14	10.2	12	8.8	5	3.6	4	2.9	138	100
30-34	2	1.9	13	12.1	65	60.7	14	13.1	8	7.5	1	1.0	4	3.7	107	100
35-39	2	2.0	4	4.1	63	64.3	15	15.3	10	10.2	1	1.0	3	3.1	98	100
40-44	1	1.5	3	4.5	42	63.7	8	12.1	7	10.6	0	0	5	7.6	66	100
45-49	0	0	4	7.7	34	65.3	3	5.8	3	5.8	1	1.9	7	13.5	52	100
50-54	0	0	3	6.8	33	75.1	4	9.1	2	4.5	0	0	2	4.5	44	100
55+	0	0	1	2.0	41	78.8	2	3.8	3	5.8	0	0	5	9.6	52	100
Total	93	7.4	181	14.4	711	56.4	94	7.5	95	7.5	19	1.5	67	5.3	1,260	100

grand mal or psychomotor attacks, or both, in adolescence or adulthood.

In the series quoted 16.5 per cent of epileptics had psychomotor seizures alone, or in combination; as years go by and as the acuity of the physician is increased, it will be noted that the incidence is even higher. For example, is was found[9] in a study of 1,000 epileptics in the Army that the incidence of psychomotor epilepsy was 26 per cent, alone or in combination.

CLINICAL TYPES OF EPILEPSY

Strictly speaking there are no two attacks which are alike, but for purposes of simplification three types of epileptic seizures may be described: grand mal, petit mal (pyknoepilepsy), and psychomotor epilepsy (psychic equivalents, epileptic equivalents, epileptic fugue states).

Grand mal epilepsy. The grand mal attack may take an almost unlimited variety of forms; that which is most commonly recognized is the tonic-clonic convulsion, which is usually thought of by everyone as synonymous with epilepsy. It is of vital importance to recognize that a grand mal convulsion may be either tonic or clonic or both, or atonic. It may begin and remain focal; it may begin focally and spread according to a physiological pattern without the loss of consciousness (jacksonian epilepsy), or rapidly or slowly become generalized accompanied by loss of consciousness. Single attacks of epilepsy may occur at widely separated intervals (months to decades), in bursts of two or more at frequent intervals, or in groups of rapidly repeated seizures without return of consciousness between the seizures (status epilepticus). Status epilepticus is dangerous and measures must be taken to stop the attack or death may ensue. Fits may last but a few seconds, or continuous jerking of a part may occur over long periods of time (epilepsia partialis continua). Seizures may even take the form of sensory attacks which frequently merge into motor manifestations, but less frequently remain entirely sensory. Convulsions may be followed by no ill effects or severe prostration.

Petit may epilepsy (pyknoepilepsy). The petit mal type is characterized by momentary lapses of consciousness, usually lasting from 5 to 30 seconds. Generally the sufferer does not fall. To the inexperienced there may be no outward manifestations; however, if one watches closely there may usually be seen a rhythmical 3 per second blinking of the eyes, occasionally twitching of the face, and at times of the upper extremities, rarely of the lower extremities. During the spells the patient usually ceases any activity with which he may be occupied; he may drop things, stare fixedly into space, or lose his place while reading or speaking. There may at times be blushing or pallor of the face, and a glassy appearance to the eyes. The patient is usually transiently unconscious and has an amnesia for these episodes, but the latter is by no means constant. An occasional patient is seen who after a proven petit mal seizure is able to answer questions coherently and relevantly, and tell exactly what happened in his environment while he was having the attack.

The term *pyknoepilepsy* (frequently petit mal) is preferable to the term *pyknolepsy*, as the latter may be incorrectly thought to be akin to narcolepsy. Pyknoepilepsy is true petit mal epilepsy. This form will not be confused diagnostically with the psychomotor type, if it is remembered that petit mal is usually of brief duration, 5 to 30 seconds, and not associated with automatic, purposeless movements or activities.

Psychomotor epilepsy (psychic equivalents). The use of the electroencephalograph in the study of problem children[3] has elucidated the dynamics of psychomotor epilepsy, perhaps the most interesting of all the epilepsies. In the past, sufferers of psychomotor epilepsy were almost without exception called hysterical. Today it is realized that this class of epileptics may be potentially dangerous; they may and have carried out violent activities including homicide, for which at the present moment they are not responsible in the eyes of the law and medicine. Yet it is this group which is probably most amenable to therapy. Briefly, these episodes are characterized by periods during which automatic activity is carried on, usually accompanied by changes of emotion (especially anger), and for which the patient has a complete amnesia. The attacks vary greatly in duration and frequency. No two epileptics with the psychomotor pattern have the same type of spells; in fact, the same individual may not have a repetition of similar episodes. Two examples are cited to illustrate the atypical behavior of the psychomotor type of epilepsy.

Case 1. A 21-year-old man took his girl friend to a theatre. In the middle of the picture he suddenly arose and left. On his arrival home, he was unable to recall his abrupt departure from the theatre. On several occasions he had been told that he said or did peculiar things, such as speak in jargon or answer questions entirely irrelevantly. Occasionally he had run after an automobile on the street, barking like a dog. For these episodes he had a complete amnesia.

Case 2. A 48-year-old man frequently did "peculiar things." On one occasion while he was in a dental chair he suddenly arose and attempted to climb the walls, muttering strangely. The attack lasted about three or four minutes.

Several homicides occurring during a psychomotor seizure have been reported. Many of these patients seen in the Army have usually come from the guard house where they had been incarcerated charged with stealing, murder, and other crimes.

ETIOLOGY

Table 2 shows the associated or underlying disease in 364 epileptics studied in the Army; the data would hold equally for any large adult civilian series. It may be seen that more than 75 per cent of epileptics are of the so-called idiopathic or essential type, that is, those in whom no associated condition may be found.

With the use of the electroencephalograph (Figure 1), it may be found that 90 per cent of epileptics have paroxysmal cerebral dysrhythmia in the

interseizure period. The incidence of abnormal brain waves in the normal population is 10 per cent. Judgment about the electrical potential of the brain is based mainly on two factors: frequency and amplitude of the sinusoidal fluctuation. Within frequencies ranging from 8.5 to 12 per second may be found 90 per cent of the normal population. In frequencies outside this range is found predominantly the epileptic population. The occurrence of any type of paroxysmal burst is about 30 times

TABLE 2.—*Associated or "Underlying" Causes in 364 Epileptics* * †

Total	"Idiopathic"	Head Injury	"Rum Fits"	Migraine	Birth Injury	Cerebral Thrombosis	Tumor	Subdural Hematomas (Acute)	Other "Causes"
364	282	34	12	7	6	6	6	2	9
Per cent	77.5	9.3	3.3	1.9	1.6	1.6	1.6	0.6	2.6

* 311 males; 53 females. † 49 of 364 gave family history of epilepsy.

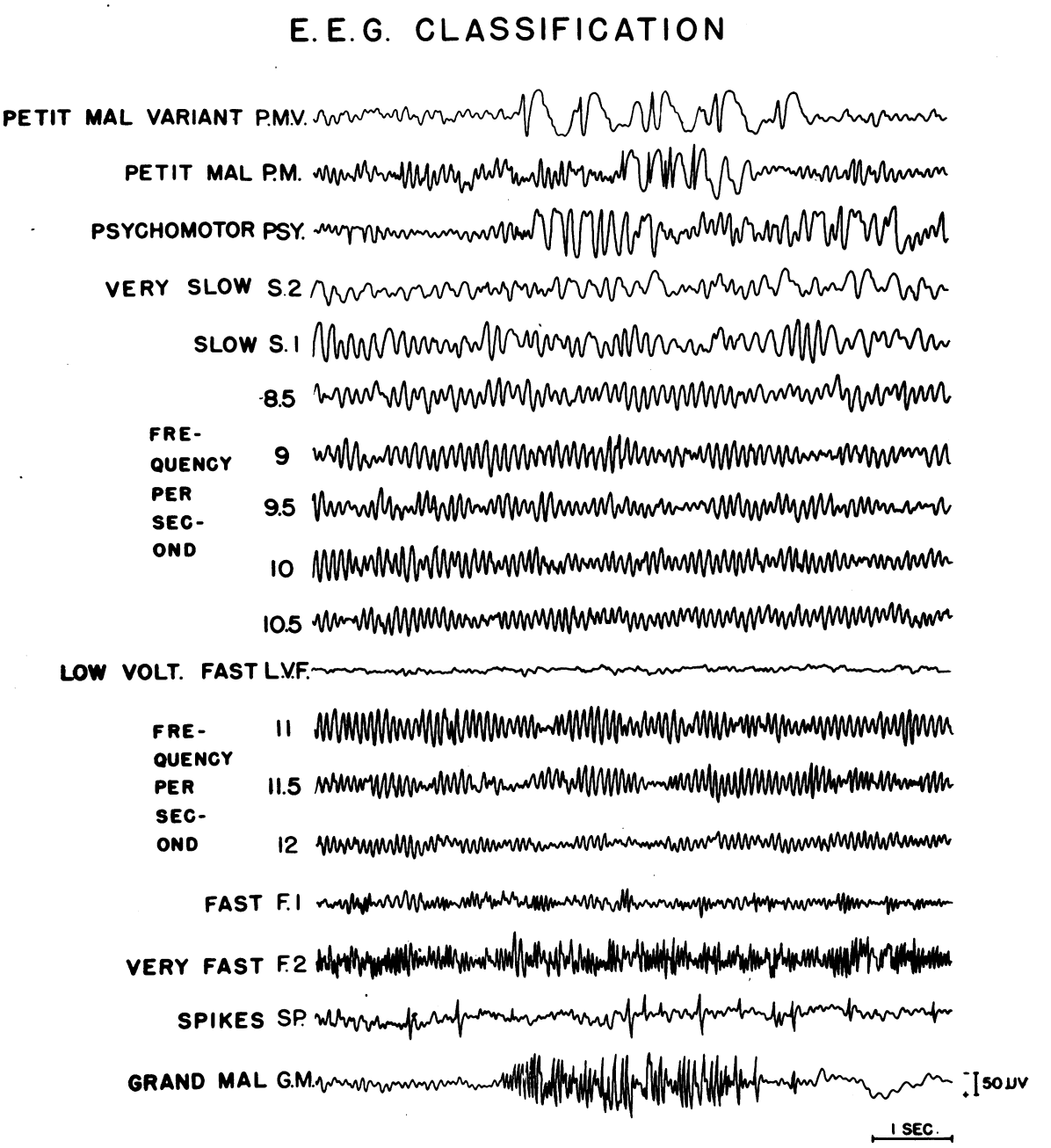

Figure 1.—Electroencephalographic classification of the epilepsies.

more frequent in an epileptic subject than it is in a normal subject. If such a record be obtained in an epileptic during sleep, paroxysmal dysehythmia will occur almost without exception.

Hereditary factors in epilepsy have gained advocates[1] with the advent of the electroencephalograph. With the use of this instrument, Lennox, Gibbs, and Gibbs[6] have studied the brain wave pattern of epileptics and their blood kin (parents, siblings, and children). Abnormal records were obtained in 60 per cent of the relatives of patients, as contrasted to 10 per cent of a control group who had no near relative with epilepsy. In 35 per cent of epileptics both parents had a cerebral dysrhythmia, and in 95 per cent of the epileptic group at least one parent had abnormal records. In this study it was thought that the evidence indicated that the dysrhythmia of epilepsy was inheritable, and that such dysrhythmia when demonstrable may represent a predisposition to epilepsy.

The same authors studied the electroencephalographic records of a large group of twins, monozygotic and dizygotic. Among the dizygotic twins tracings were found to be unlike in 95 per cent and alike in 5 per cent. In the monozygotic twins the tracings were judged to be identical in 85 per cent, not identical in 4 per cent, and in 11 per cent the identity was in doubt.

The authors concluded "These results suggest that the brain wave pattern is an hereditary trait, and in the absence of an acquired condition which may have modified the brain wave pattern, . . . the electroencephalogram may be used in human genetic studies and in the tracing of heredity of neuropsychiatric diseases associated with cerebral dysrhythmia."

Epilepsy should not be associated with imbecility. In a study[4] of the records of nearly 2,000 clinic and private patients with epilepsy it was found that the intelligence of 67 per cent was average or above average, 23 per cent slightly below average, and only 10 per cent grossly deficient. These figures compare favorably with those of the population in general.

The impression that repeated fits may lead to mental deterioration may be explained by the following factors alone or in combination: (1) Following a convulsion many epileptics are confused or slowed mentally for a period of time varying from minutes to days; (2) If an individual has a large number of seizures, the possibility of brain damage occurring is great. However, with modern therapy there is no excuse for most epileptics to have frequent seizures; (3) In the past, epileptics were controlled by the use of large quantities of sedatives, such as bromides and barbiturates, sedating the patients to the point where they were not clear mentally. With the advent of modern anti-convulsants, sedatives have played a smaller role, and this factor has assumed lesser importance in the production of mental malfunction.

USE OF THE ELECTROENCEPHALOGRAPH IN EPILEPSY

In the past much stress has been placed on the use of the electroencephalograph as a diagnostic procedure in the study of epilepsy. Now that we have gained more insight less importance is placed on the electroencephalograph from the diagnostic standpoint. There is nothing specific or pathognomonic about the electroencephalograph in epilepsy or in any other condition. Its clinical use should be limited to its application as an adjunct in the study of the unusual conditions (variants of pyschomotor epilepsy) or as a confirmatory factor. Its most valuable use is in prognostic and therapeutic studies. In well over 80 per cent of epileptics it is not necessary to have an electroencephalographic tracing to confirm the diagnosis.

In the study of the less familiar types, such as the psychomotor epilepsies, it is frequently of importance to have electroencephalographic tracings in serial fashion. The psychomotor group notoriously have a high incidence of electroencephalographic normality in the interseizure period. However, if serial records are taken daily or weekly, it is at times possible to predict the occurrence of a fit. As epilepsy is an episodic disease clinically, a similar reaction would be expected electrically.

We believe that if a sufficient number of electroencephalograms are taken on the epileptic subject, attempting to obtain one of them just before or after an ictus, the percentage of electroencephalographic abnormality would approach 100 per cent.

Figures 2, 3, 4, and 5 demonstrate electrically the three main types of epilepsy. In the grand mal type (Figure 2) there are rapidly recurring spikes of a frequency of about 30 per second which tend to appear in a crescendo-diminuendo fashion. The petit mal type (Figures 3 and 4) is characterized by the rhythmical three per second dart and dome activity or spike and slow waves. The type of pattern seen most frequently with psychomotor epilepsy (Figure 5) is characterized by the appearance of high voltage, irregular, square-topped 4 to 6 per second waves with 14 to 16 per second waves engrafted thereon and positive (downward deflection) spikes.

TREATMENT

The therapy of epilepsy may be divided into three phases: specific, general, and social-psychiatric.

Specific. Innumerable drugs have been tried in epilepsy. We believe the best to be dilantin sodium, the anticonvulsant properties of which were first described by Merritt and Putnam[7]; it is unique among the anti-convulsants in that it has no sedative action. Properly used, it has been found to be extremely efficacious in the treatment of both the grand mal and psychomotor attacks of epilepsy, but of little or no value in petit mal.

Dilantin at the present time is the sheet anchor in the drug therapy of epilepsy. Treatment is usually begun by administering a single capsule of dilantin (0.1 gram) after dinner for three to seven days, gradually increasing the dosage by one capsule weekly, until the seizures are brought under control. By administering the drug in this manner, some of the annoying toxic reactions such as ataxia, drowsiness, blurring of vision, morbilliform rash, and the more occasional fever and gastric distress may be avoided. Six capsules (0.6

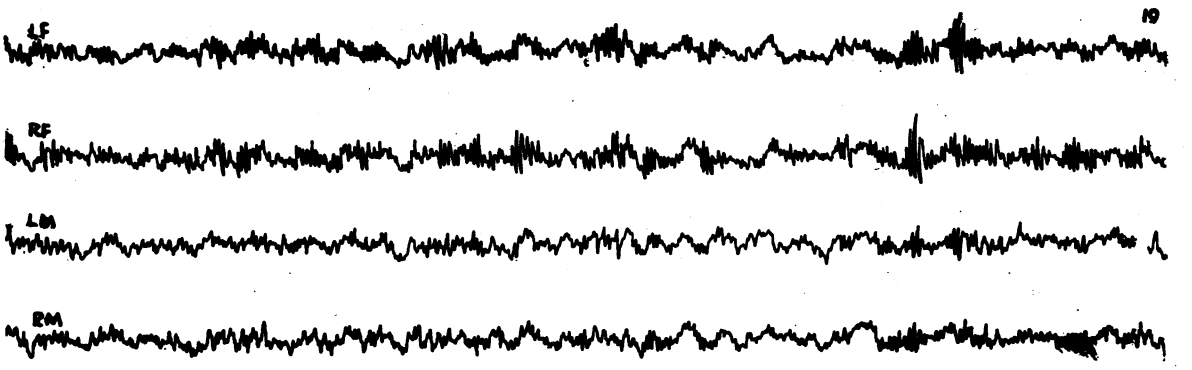

Figure 2.—Grand mal epilepsy.

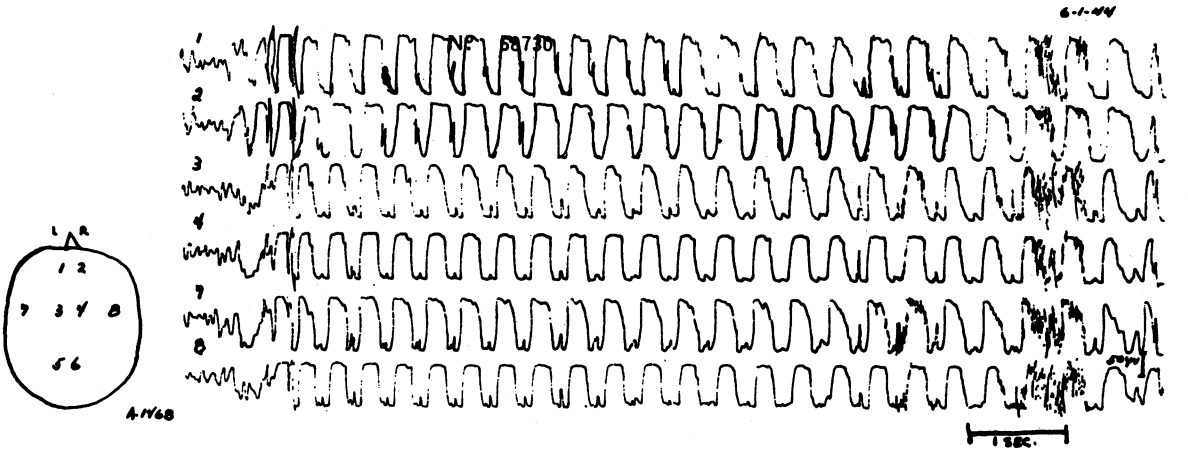

Figure 3.—Petit mal epilepsy.

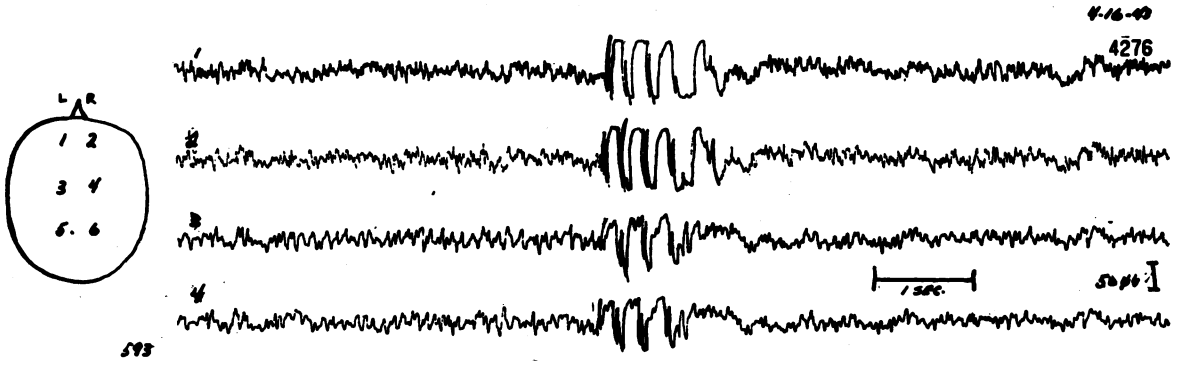

Figure 4.—Petit mal epilepsy.

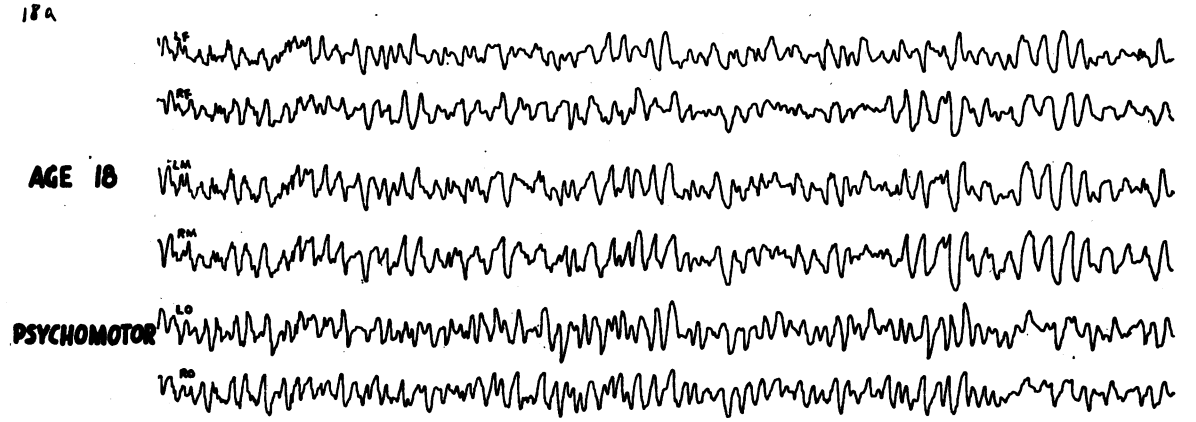

Figure 5.—Psychomotor epilepsy.

gram) should be the maximum allowed the adult per day. Dilantin sodium is strongly alkaline and must be taken during or immediately after meals to prevent gastric distress. If untoward effects are manifest, it is best to reduce the dose by a single capsule. The usual, minimal, daily effective dose in the adult is three capsules (0.30 gram), and this amount may be administered on the first visit if rapid results are required.

The most common reason for failure of dilantin therapy is that the physician does not use the drug in large enough amounts. Also it may require several months of medication before the patient is adequately controlled. If, however, the maximum amount of dilantin (to the point of toxicity) is given and therapeutic effects are wanting, then another anticonvulsant drug may be tried. This usually should be phenobarbital, the dosage and administration of which is identical to that of dilantin. When neither of these drugs is effective alone, the combination of the two may be quite effective. In a small percentage of cases of grand mal epilepsy the combination may be ineffective. Then the phenobarbital should be *gradually* reduced and the administration of another anticonvulsant, possibly mebaral, initiated in combination with the dilantin.

Once the patient has been established on an anticonvulsant, it should never be completely withdrawn suddenly. Sudden withdrawal will almost certainly produce convulsions in the susceptible person, and in the case of withdrawal of phenobarbital fits may occur in those persons who never before had them. Probably there is no more certain way to induce the dread status epilepticus in the person with convulsive diathesis. If it becomes necessary to withdraw one of the drugs it must be done quite gradually over a period of about two months, and in the person subject to epilepsy another drug is substituted in full dosage at the beginning of the program of withdrawal.

The desired effect in all cases is complete cessation of attacks with a minimum of toxic symptoms. If drug therapy is handled expertly such results may be expected in 90 per cent of patients having grand mal and/or psychomotor seizures.

Hypertrophy of the gums tends to occur with the prolonged use of dilantin, especially in children. This may be largely prevented with proper mouth hygiene, particularly frequent massage of the gums. However, in some instances the excess gum tissue must be excised surgically. Mesantoin, a hydantoin derivative does not produce gum hypertrophy and may be substituted for dilantin if gum hypertrophy is troublesome.

Other drugs which may be used in the therapy of epilepsy are methylphenylethyl hydantoin (mesantoin), adminstered in doses similar to that of dilantin; the untoward reactions are somewhat alike. Glutamic acid given in doses of 8 to 16 grams a day has been found by some workers[8] to decrease the number of petit mal attacks. However, it is rather cumbersome to administer, and will probably fall into disuse in view of the gratifying reports with the use of tridione in petit mal. In some cases of petit mal epilepsy benzedrine sulfate has been found to be of value, as has caffeine. These drugs might be given a trial if other substances failed to give relief.

In 1945 Lennox[5] reported the use of tridione in petit mal epilepsy over a period of some 15 months. This drug was administered to a group of 50 patients subject to daily, frequent petit mal, myoclonic, or akinetic seizures not benefited by previous medication. In a period of days to weeks the minor seizures ceased in 28 per cent, were reduced considerably in 52 per cent, and were little affected in 20 per cent. In several patients the seizures, once halted, did not return when medication was discontinued, a feature which has never occurred with other anticonvulsant drugs in any type of epilepsy. In ten other patients with daily petit mal and frequent grand mal seizures, tridione halted or lessened the petit mal, but proved ineffective against the grand mal seizures and in some patients even increased them. The medicine is dispensed in capsules each containing 0.32 Gm. (5 grains). Doses used varied from 1.0 to 2.0 Gm. (15 to 30 grains) a day without much regard for age. The principal untoward effect was that of photophobia. One or two deaths with tridione have been reported; the patient taking this drug should be under close supervision.

It has been our practice, once the seizures are under control to continue the anticonvulsant medication for a period of three to five years, even though no seizures are experienced. Only then may the anticonvulsant drug be gradually reduced over another one or two years.

The expense of drugs in the treatment of epilepsy is not great; Table 3 shows the relative cost of various anticonvulsant drugs. It should be noted that the use of a drug under its chemical name saves from 50 to 100 per cent in the yearly cost.

Treatment of Status Epilepticus. Status epilepticus is a dangerous condition, these repeated convulsions must be halted if the patient is to survive. The most efficacious drug which has controlled the convulsions of practically all patients suffering from status epilepticus is paraldehyde, which is administered by intravenous injection of 2 cc. or more. The results by this route are more rapid than those with intramuscular or rectal administration; the latter may be used with doses of 8 cc. and 16 cc. respectively. If paraldehyde is not available, sodium phenobarbital or sodium amytal in doses of 7.5 grains (0.5 gram) to 15 grains (1.0 gram) may be administered intravenously. Morphine, drop ether, or chloroform may be effective. It must be stressed that repeated convulsions may not be halted by the homeopathic administration of drugs; large quantities are necessary. After the administration of one of these drugs, it is well to place a tube into the stomach (via the nose) and to give 1.5 grains (0.1 gram) of dilantin every four hours along with nutritious fluids until the seizures are under control. The fluids will help to relieve the fever which always develops with repeated convulsions and will permit a somewhat more rapid recovery.

In modern conceptions of the treatment of epilepsy, diet and dehydration play little part. The ketogenic diet is extremely distasteful and prac-

TABLE 3.—*Yearly Cost of Drugs Used For Epilepsy*

	Quantity Bought & Price	Daily Dose Grams	Daily Dose Grains	Cost Per Year
Phenobarbital, 0.1 gm. (1½ grain) tablets	100 @ $0.75	0.1	1½	$2.75
Luminal (phenobarbital, Winthrop), 0.1 gm. (1½ grain) tablets	50 @ 1.25	0.1	1½	9.10
Phenobarbital elixir	16 oz. @ 1.50	0.1	1½	26.30
Sodium bromide 0.65 gm. (10 grain) tablets	1000 @ 2.90	3.0	45	4.75
Sodium bromide solution	6 oz. @ 0.80	3.0	45	18.25
Diphenylhydantoin sodium, 0.1 gm. (1½ grain) capsules	100 @ 1.20	0.3	4½	13.20
Dilantin sodium, 0.1 gm. (1½ grain) capsules	100 @ 2.00*	0.3	4½	21.90
An "epilepsy cure" **	4 weeks' supply	Unknown		50.00

* The retail price in Boston drug stores is from $1.75 to $2.50.
** Including cathartic and other unimportant ingredients.

tically impossible to administer, and even under the most favorable circumstances controls only a very few cases (usually children). The question about limitation of fluid intake in epileptics is not a particularly important one.

GENERAL

There can be no question that alcohol encourages an increased incidence of convulsions; it must be rigorously forbidden in any form. Inactivity is contraindicated, and it is rather well known that the epileptic in good physical condition has fewer and less severe attacks than one who is out of condition; therefore a program of physical work or exercise is advisable for these people. An epileptic gets along better if he is employed than if he is not, and schooling should be continued if it is at all possible.

Social-Psychiatric: Once the diagnosis of epilepsy is made, some attempt to acquaint the patient with his disease should be made. The need for dissemination of the latest information concerning epilepsy is emphasized; the patient should be encouraged to partake in the activities of the American Epilepsy League* whose primary purposes are the education of the public toward a more sympathetic and intelligent understanding of epilepsy, and the stimulation of research.

A program of reading** concerning epilepsy should be suggested to the patient. It should be stressed that epilepsy is a most individualized disorder and that some of the conditions which apply to other patients may not apply to him.

It should be pointed out to the patient that he may not be employed in occupations which expose others or himself to danger, e.g. (1) require him to operate a vehicle (many states have laws which forbid epileptics to obtain a license to operate a motor vehicle, (2) work in high, exposed places, or (3) the manipulation of complicated or exposed machinery.

It has been our experience that an epileptic invariably becomes a cooperative and grateful patient, and not infrequently acts as a spearhead in the attack against social ostracism by attempting to educate not only himself but his family, friends, and even his physician.

The relationship between emotional factors and fits has been recognized for centuries. Relief by psychological approaches has been noted by many, and reports of occasional cures of epilepsy by psychotherapy are factual and based on sound principles. The passive excommunication of these subjects from the community is psychologically traumatizing, as are the other restrictive techniques that have been applied to these patients by their family, friends, and well-meaning physicians.

It is only by the education of the medical profession that we may hope to relieve the misery caused by this very important disease. As has been mentioned previously, epilepsy is a problem of the magnitude of tuberculosis or diabetes. Moreover, with the aid of the electroencephalograph it has been demonstrated that for every overt epileptic there are twenty carriers, in other words 20 people with an epileptic diathesis. Yet this problem has been given less publicity and is the subject of less research than either tuberculosis or diabetes. A disease which ramifies through the population as does epilepsy deserves much more attention than it at present obtains.

* The Headquarters of the American Epilepsy League are Room 405, 50 State Street, Boston. The League is a non-profit organization, established primarily for dissemination of useful information concerning epilepsy to the laity.

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